

*SCIENTIFIC
ILLUMINATION
for Schools.*

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SCIENTIFIC ILLUMINATION FOR SCHOOLS

BOOKLET No. 120

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**THE NEW "BIG SCHOOL"
AT HAILEYBURY COLLEGE,
HERTFORD.**

SCHOOL LIGHTING.

It is our purpose through the medium of this Booklet, to point out the importance of adopting the best, and at the same time, the most efficient illumination for the exacting requirements of the School Room.

The School Superintendent or Principal, as well as the School Authority and Architect will realise at once that **the problem of good School Lighting** is by no means a simple matter that can be handled in a haphazard manner. The eyesight of the millions of school children in this country is far too valuable to jeopardize by such a policy.

For these reasons, those responsible for school equipment may be interested in noting the announcement in this Booklet that the Holophane Company, which has had 25 years' experience in dealing with lighting problems of various kinds, is prepared to make complete plans for scientific lighting as part of its service. This Company will, therefore, welcome at all times the liberal use of its Illuminating Engineering Department by School Boards or Architects who demand the best illumination for the Schools.

HOLOPHANE LIMITED.

Why Good Lighting is Important.

The number of school children in this country is several millions. Statistics show that of this number a substantial percentage has defective vision, and that this percentage tends to increase with the older classes. This increasing proportion of those with bad eyesight may be traced to a considerable extent to the way in which the eyes are used in the every-day work in the schoolroom, and is largely due to the conditions which surround vision. The school-room lighting is one of these important conditions.

Amongst the most important points which require consideration and treatment to ensure good lighting are (1) avoidance of glare whether from the lamps used or from the blackboard, (2) intensities of illumination which vary according to the class of work for which a particular room is intended to be used, and (3) the correct planning of the points of the lamps so that an even distribution of the light over the working plane is obtained when the proper reflectors are used. There are also other points which can materially assist good illumination, all of which are treated in this booklet.

Reducing Glare.

The increasing brilliancy of modern lamps is becoming more and more a menace to eyesight. The new gas-filled lamp, although it possesses the great advantage of high efficiency, has the highly objectionable feature of excessive brilliancy.

Unless the eyes of those in the room are adequately protected from its glare, permanent injury to eyesight may result from this cause. The contrast of the great brilliancy of this new lamp with older types of lamps is very marked.

Glare from Blackboard.

Nearly everyone has experienced a disagreeable effect when looking at a blackboard owing to the sheen of reflected light directed towards the eyes. In artificial light, as well as in daylight, this reflection from blackboard surfaces is objectionable. To avoid this care should be taken to keep the surface of the boards a dull finish, and to place the lamp in such a position as to obviate this objection.

It may be necessary in some cases to provide special blackboard lamps for minimising the glare or sheen effect, and in new buildings there is some choice in the original position of the boards with

respect to the desks. If special difficulty has been experienced in the rooms of the building from this cause, it will be desirable to mention this fact and to show the positions of the boards on the drawing which is sent this Company when a request for an illumination specification is made.

Intensities of Illumination.

One of the highly important points to consider in planning the school lighting system is that of a suitable quantity of light. In the past, this feature has not received the attention it deserves, and many school lighting installations have been made without regard to the volume of light necessary for the different departments of the building.

A code of school lighting has been recently published in which the following intensities are recommended for various classes of work which are found in connection with typical modern schools :—

POSITION.	Foot candles at the work Artificial Lighting.	
	Minimum.	Ordinary Practice.
Storage Spaces	0.25	0.5—1.0
Stairways, Corridors	0.5	1.0—2.5
Gymnasiums	1.0	2.0—5.0
Rough Shop Work	1.25	2.0—4.0
Halls, Assembly Rooms	1.5	2.5—4.0
Class Rooms, Study Rooms, Libraries, Laboratories, Blackboards ...	3.0	3.5—6.0
Fine Shop Work	3.5	4.0—8.0
Sewing and Draughting Rooms ...	5.0	6.0—12.0

NOTE.—Under the columns headed “ Ordinary Practice ” the upper portion of the range of intensities is preferable to the lower.

It should always be remembered in the case of such a table that quantity of light is only one of the factors on which good vision depends. To take into account fully all the factors and thus to assure the best possible disposition of lamps, advantage should be taken of the Holophane Illuminating Engineering Department whenever new equipment or a re-arrangement of older equipment is contemplated.



**A CLASS-ROOM AT
BIRMINGHAM.**

Planning the System for The New School Building.

There is, of course, a very great advantage in making a scientific plan of the lighting before the wiring is installed so that the outlets for the lamps may correspond to the requirements of modern illumination. This is a simple matter in the case of a new building, provided the architect or the school authority gives the question careful consideration well in advance.

It is an all too common plan, however, to leave the matter of lighting to the last and not to consider the question of lamps and reflectors until all of the wiring has been completed. In such cases the fact is often realised too late that a change in the arrangement of ceiling outlets, if it had been made at the time of installing the wiring, would have been capable of producing a vast improvement in the illumination effect.

Mounting the Lamps well Overhead.

As a general policy it is desirable to instal the lamps well overhead, that is, as near the ceiling as possible. The only exception to this might be in the larger rooms which possess unusually high ceilings.

Not only does high mounting keep the units well above the line of vision, thus reducing the glare effects, but the efficiency of the system may also be increased slightly by the added light sent to the floor due to ceiling reflection.

Keep Ceilings and Upper Walls a Light Colour.

The interior finish of schoolrooms, apart from its artistic influence on the appearance, also has a most important bearing on the result which may be expected from the lighting system. No matter how excellent a lighting system may be, if the interior of the room in which it is installed is dark and gloomy, such a large amount of light will be absorbed by dark walls and ceiling surfaces that the effectiveness of the illumination will be greatly reduced. It is most advisable for these reasons to maintain ceilings and at least the upper portions of walls in a light colour, so that they may reflect and conserve most of the light which is thrown upon their surfaces.



**WORKSHOP AT CITY OF LEEDS
TRAINING COLLEGE.**

Importance of Cleaning.

It is very important to note that the regular and systematic cleaning of reflectors is a small item of expense, and one which pays for itself over and over again in the advantages gained by such a course. Classroom windows are cleaned regularly to let in the daylight which costs nothing. Lamps and reflectors should also be cleaned periodically so as to obtain the full value of artificial light, which costs money.

Modern Units in the Holophane System.

The recent developments in the Holophane scientifically designed units have now reached a stage whereby it is possible to attain these ideal conditions of light control, with economy both in the initial investment as well as in the expense of operation.

Three principal types of units for school lighting purposes have been designed, known as :—

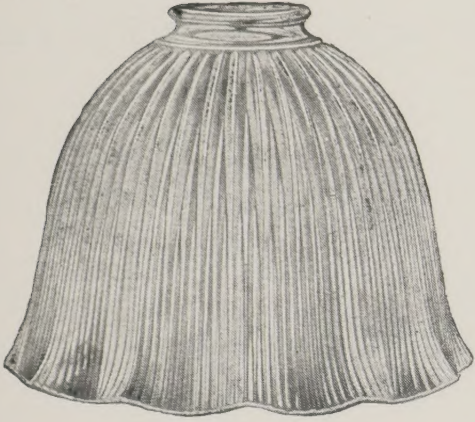
- (a) Holophane reflectors or open units (*see Fig 1, page 9*).
- (b) Holophane Reflector-Refractors or semi-enclosing units (*see Fig. 2, page 9*).
- (c) Holophane Excellites or enclosing units (*see Fig. 3, page 9*).

The harm which can be done by the use of the new type gas-filled lamp, if not adequately shielded from the eyes, has been fully realised by this Company in its design of new reflectors. With its new line of Reflector-Refractors, for example, the lamp is so placed that it is impossible to see the filament except from positions directly under the lamp.

The Excellites, with their enclosing features, naturally take into account fully the matter of eye protection.

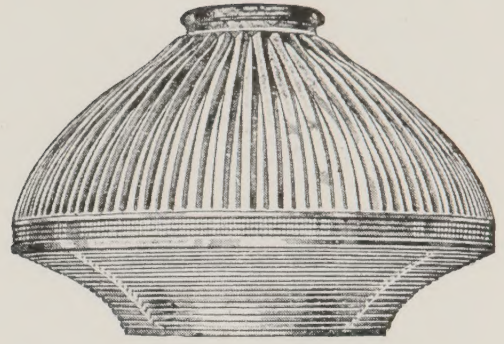
It is very important to note that the surface of Holophane reflectors does not depreciate or become injured by the heat which is produced by gas-filled lamps. The reflecting surface, being of crystal glass, remains permanently in its original efficient condition irrespective of the large amount of heat developed by these modern lamps.

Fig. 1.



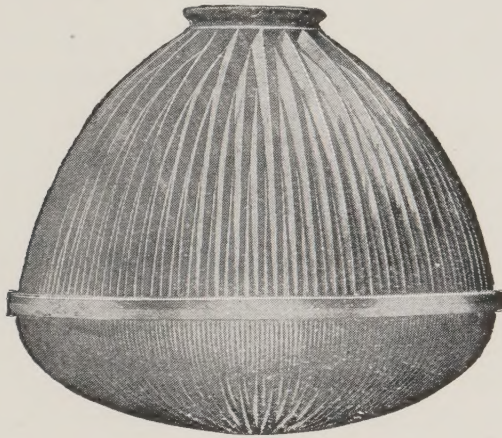
Stiletto Reflectors for use
in Class-rooms.

Fig. 2.



Reflector-Refractor Unit for use
in Class-rooms, Corridors, &c.

Fig. 3.



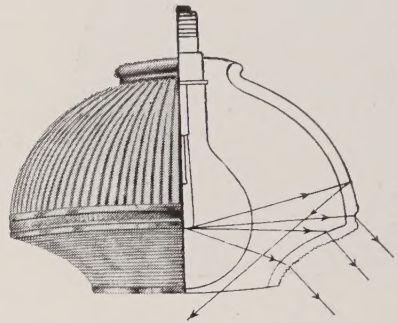
Excellite Units for use in Halls and the
larger rooms connected with the modern
school building.

Holophane Reflector-Refractors.

This unit, as illustrated in Fig. 2, combines an efficient Holophane Reflector as the upper part of the device, with a scientifically designed Holophane Refractor as the lower part. The upward rays of light from the lamp are re-directed downward by the upper reflector part. Much of this reflected light passes through the opening below the unit, while most of the remaining light is caught by the Refractor part, the prisms of which are designed to redirect this light downward at the most useful angles. This unit, therefore, includes the enclosing feature to some extent, and, at the same time, results in an unusually

high efficiency in the percentage of the total light which is made available in downward directions. The action of this unit is well illustrated in Figure 4.

Fig. 4. Diagram showing the internal action of the Holophane Reflector-Refractor Unit. A large proportion of the light sent downward by the upper reflector, passes through the opening below. The lower part of the unit, known as a Refractor, acts as a protection for the eyes and also directs a large portion of the light at a useful angle to the desk surfaces.



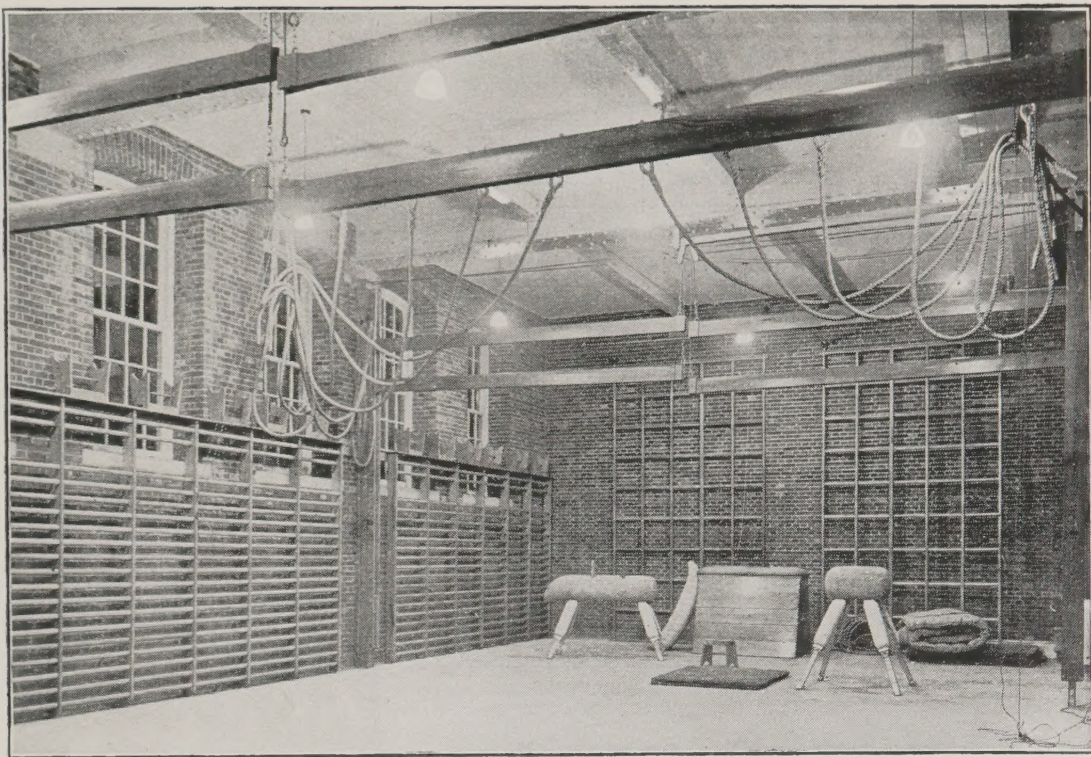
In the smaller sizes the two parts of the Holophane Reflector-Refractor are mechanically fused together, thus making the unit the equivalent of one solid piece. Its relatively small size is a feature, but in spite of its small dimensions the bottom opening makes it possible to renew or clean the lamp conveniently. The slanting walls of smooth glass tend, furthermore, to prevent accumulations of dust and dirt which insure the system against a rapid depreciation from this cause. For classroom lighting, therefore, the Reflector-Refractor unit is particularly recommended, being efficient and glare subduing. These features make it a most valuable auxiliary for school lighting systems.

Holophane Excellites.

The completely enclosing feature of this device is shown in Fig. 3, page 9. The unit consists of two sections which are fastened together mechanically, thus making it one piece in its essential feature. The upper portion is an efficient Holophane Reflector so designed as to reflect a large proportion of the total generated light to the under bowl. The latter acts as a diffusing medium in reducing glare, and at the same time distributes the light effectively.

Holophane Excellites are especially suited to large interiors with high ceilings, and where the outlets are relatively far apart, as, for example, in large halls, etc.

For rooms with lower ceilings, the open Holophane Reflector or the Holophane Reflector - Refractor are preferable types to use.



A GYMNASIUM.

Holophane Reflectors for Gas Lamps.

In addition to the foregoing types of Holophane equipment for electric lamps, there are available a considerable number of Holophane Reflectors which have been designed especially for gas lamps. In those schools, therefore, where the lighting is furnished by gas only, or where a combination gas-electric system is adopted, it will be of general help to the lighting results if use is made of these especially designed reflectors for gas lighting.

Summary.

It is apparent that the eyesight of the host of children must be conserved for the good of the commonwealth. No cost should be spared to make the lighting conditions as nearly ideal as possible. In these days of national crisis, the bywords are conservation and economy. There is, therefore, a fundamental financial reason for obtaining a lighting system which gives the maximum amount of light at the minimum cost for energy and maintenance. The Holophane school lighting equipment described in this booklet will produce more useful illumination for a given size of lamp than any other equipment available. This guarantees the greatest illumination effect with the least expenditure for current, as compared with any other system of illumination.

Holophane Service.

To the engineering profession the name HOLOPHANE stands for pioneer development in the lighting field. The object of this Company is to maintain this principle of facing squarely the changing requirements which are imposed by new types of lamps and by new conditions, and to meet these conditions with a maximum degree of efficiency, and at the same time to adhere rigidly to the principles of scientific illumination.

This policy will show that the ideals at the back of our products give us an interest in the prospective customer and his lighting problem which is deeper than a purely commercial consideration. Our Illuminating Engineering Department is capable and ready to supply the information which will make your school illumination the best and most efficient, in keeping with the present possibilities of the art. As announced in the pages of this booklet, our engineers are placed at your disposal and will be glad to recommend the type of equipment which is best suited to the individual needs of the various rooms of your school buildings.

Holophane service has behind it the accumulated experience of twenty-five years of illuminating engineering developments. Naturally, its expert engineers should be qualified to offer lighting suggestions embodying the highest degree of illumination efficiency.

The services of these engineers are offered you for advice or consultation, without cost or obligation.



